CLAIMS

1. A device for generating hydrogen from a water vapor containing exhaust, said device comprising an exhaust diverter and a hydrogen generation section, wherein:

said exhaust diverter is configured to divert a portion of said exhaust and deliver said diverted exhaust to said hydrogen generation section;

said hydrogen generation section comprises an electrolysis unit defining a hermetically sealed void volume configured to accumulate and store hydrogen generated by said electrolysis unit; and

said hydrogen generation section is configured to deliver said hydrogen at a hydrogen output of said electrolysis unit.

2. A device as claimed in claim 1 wherein said void volume is characterized by a volumetric capacity of about 0.01 mL per square centimeter of electrolysis unit cell area at a pressure of about 300 psi (2100 kPa).

3. A device as claimed in claim 1 wherein said void volume is characterized by a volumetric capacity of about 0.2 mL per square centimeter of electrolysis unit cell area at a pressure of about 50 psi (2100 kPa).

4. A device as claimed in claim 1 wherein said void volume is characterized by a volumetric capacity of between about 0.01 mL and about 10 mL per square centimeter of electrolysis unit cell area at pressures of between about 5 psi (35 kPa) and about 1500 psi (10,500 kPa).

5. A device as claimed in claim 1 wherein said hydrogen generation further comprises a pressure monitor configured to monitor said accumulation and storage of hydrogen within said void volume.

6. A device as claimed in claim 1 wherein said hydrogen generation section comprises at least one hydrogen injector configured to control release of hydrogen stored within said void volume.

7. A device as claimed in claim 1 wherein said device further comprises a controller configured to monitor accumulation and storage of hydrogen in said void volume.

8. A device as claimed in claim 7 wherein monitoring of said accumulation and storage of hydrogen is enabled through a pressure monitor in communication with said controller.

9. A device as claimed in claim 8 wherein said pressure monitor is configured to monitor pressure of said hermetically sealed void volume.

10. A device as claimed in claim 1 wherein said electrolysis unit comprises an external box type manifold on an exhaust input side of said electrolysis unit.

11. A device as claimed in claim 10 wherein a width dimension of said electrolysis unit, defined along said external box type manifold is at least twice as large as a length dimension of said electrolysis unit, defined between said exhaust input side and an exhaust output side of said electrolysis unit.

12. A device as claimed in claim 10 wherein flow field grooves defined by said electrolysis unit extend at least as far as said external box type manifold.

13. A device as claimed in claim 10 wherein said external box type manifold is tapered from a maximum cross sectional area at an input side of said manifold to a minimum cross sectional area at an output side of said manifold.

14. A device as claimed in claim 1 wherein said electrolysis unit is thermally coupled to an exhaust duct carrying said exhaust.

15. A device as claimed in claim 1 wherein said hydrogen generation section is configured to return an oxygen-enriched exhaust to a non-diverted portion of said exhaust.

16. A device as claimed in claim 1 wherein said electrolysis unit is configured to generate a substantial amount of hydrogen from a diverted exhaust characterized by a fractional relative humidity of about 1 to about 3 percent.

17. A device as claimed in claim 1 wherein said hydrogen generation section comprises an electrolysis unit configured to generate a substantial amount of hydrogen from a diverted exhaust characterized by a fractional relative humidity of about 3% at about 125°C.

18. A device as claimed in claim 1 wherein said hydrogen generation section comprises an electrolysis unit configured to generate a substantial amount of hydrogen from a diverted exhaust characterized by a fractional relative humidity of about 80% at about 92°C.

19. A device as claimed in claim 1 wherein said hydrogen generation section is configured to deliver substantially pure hydrogen at said hydrogen output of said electrolysis unit.

20. A device as claimed in claim 1 wherein:

said device comprises an engine configured to generate torque; and

said engine generates said exhaust.

21. A device as claimed in claim 20 wherein said engine comprises a diesel engine.

22. A device as claimed in claim 20 wherein said engine is configured such that said exhaust is characterized by an oxygen content of about 1 to about 20 percent, by weight.

23. A device as claimed in claim 1 wherein said device comprises:

a vehicle body; and

an engine configured to generate said exhaust and sufficient torque to accelerate said vehicle body.

24. A device as claimed in claim 23 wherein said device comprises a controller configured to deactivate said exhaust diverter where said vehicle body decelerates.

25 A device for generating hydrogen from a water vapor containing exhaust, said device comprising an exhaust diverter and a hydrogen generation section, wherein:

said exhaust diverter is configured to divert a portion of said exhaust to said hydrogen generation section;

said exhaust diverter is in communication with a heat exchanger configured to increase fractional relative humidity of a portion of said diverted exhaust by cooling said diverted exhaust;

said hydrogen generation section comprises an electrolysis unit configured to generate hydrogen from said diverted exhaust; and

said hydrogen generation section is configured to deliver said hydrogen at a hydrogen output of said electrolysis unit.

26. A device as claimed in claim 25 wherein said heat exchanger is configured increase said fractional relative humidity to at least about 70%.

27. A device as claimed in claim 25 wherein said heat exchanger is configured increase said fractional relative humidity by at least a factor of two.

28. A device as claimed in claim 25 wherein said heat exchanger comprises an air-to-air heat exchanger.

29. A device as claimed in claim 25 wherein said diverted portion of said exhaust comprises less than about 25% of said exhaust.

30. A device as claimed in claim 25 further comprising a semi-permeable membrane configured to extract or concentrate water in said diverted exhaust.

31. A device as claimed in claim 25 further comprising a condensation unit configured to extract or concentrate water in said diverted exhaust.

32. A device comprising an engine configured to generate torque and a nitrogen oxide containing exhaust, at least one peripheral system, and a NO_X removal system for removing nitrogen oxides from said nitrogen oxide containing exhaust, said NO_X removal system comprising a NO_X treatment section, an exhaust diverter, and a hydrogen generation section, wherein:

said NO_X treatment section is configured to remove nitrogen oxides from said exhaust;

said exhaust diverter is configured to divert a portion of said exhaust to said hydrogen generation section;

said hydrogen generation section is configured to deliver hydrogen to said NO_X treatment section;

said hydrogen generation section is configured to generate oxygen as a byproduct of hydrogen generation and deliver said oxygen with said diverted exhaust to said peripheral system.

33. A device as claimed in claim 32 wherein said peripheral system comprises a fuel injection system of said engine.

34. A device as claimed in claim 32 wherein said peripheral system comprises an engine cooling system.

35. A device as claimed in claim 32 wherein said peripheral system comprises a suspension system.

36. A device as claimed in claim 32 wherein said peripheral system comprises a gaseous filter regeneration system.

37. A device as claimed in claim 32 wherein said peripheral system comprises a hydrogen storage system.

38. A device as claimed in claim 37 wherein said hydrogen storage system comprises hydrogen dispensing hardware.